State of Vermont

AGENCY OF ENVIRONMENTAL CONSERVATION

Montpelier, Vermont 05602

Department of Fish and Wildlife
Department of Forests, Parks, and Recreation
Department of Water Resources & Environmental Engineering
State Geologist
Natural Resources Conservation Council

DEPARTMENT OF FORESTS, PARKS AND RECREATION
Central Vermont District
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November 21, 1985

TO: Margaret Miller-Weeks, USFS
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FROM: Ronald Kelley
Forest Protection Specialist

SUBJECT: 1985 Vermont Spruce Budworm Mortality Data

Tree mortality and growth data estimated for 1985 is as follows:

Area of Host Type (thousands of acres)	Mortality Area (thousands of acres)	Mortality (during past year) Number of Dead Trees (thousands)	Volume of Dead trees (thousands of cu. ft.)
822	12	135	1,155

Volume of growth in mortality area (thousands of cubic feet)

Accretion	Ingrowth
41	19

Our methods for obtaining the mortality data are the same as described in the 1984 mortality survey narrative except that three new plots were established to bring the total number of plots to twelve - four each in stands of light, moderate and heavy mortality. Each plot contains 100 permanently marked host trees that are examined annually to determine recent mortality.

Accretion and ingrowth data for undefoliated trees is assumed to be 17 cu. ft. and 8 cu. ft., respectively, based on past inventory data. Since there is a three year lag between defoliation of new growth and when it influences increment reduction at breast height, 1982 defoliation should still be influencing growth within the mortality areas. Therefore, growth data for 1985 has been adjusted by reducing average increment by 80% for the moderate to heavy 1982 defoliation that occurred in stands containing mortality.

Average tree mortality between October 1984 and October 1985, in our plots was 2.5%, 2.5%, and 6.5%, respectively, for light, moderate, and heavy mortality areas compared to 3.5, 5.6, and 16.3% in 1984.

AGENCY OF ENVIRONMENTAL CONSERVATION
DEPARTMENT OF FORESTS, PARKS & RECREATION

STATE OF VERMONT

FOREST INSECT AND DISEASE CONDITIONS
NORTHERN REGION

CALENDAR YEAR 1985

Prepared by:

Ronald S. Kelley
Forest Resource Protection
November 1985

INTRODUCTION

The information in this report is based largely on aerial surveys conducted in late August to early September to detect defoliation, dieback, or mortality, plus ground surveys and observations of Forest Resource Protection personnel and other forestry and agency staff.

Aerial surveys were conducted on the following dates: District III-29 August (every other flight line); District IV-11 September (six of nine lines); District IV-11, 12, 17 September (all lines).

FOREST INSECTS

Hardwood Defoliators

Gypsy Moth, Lymantria dispar, populations remain very low with no defoliation detected. Two plots were established on Arrowhead Mountain in Milton, for counts of larvae beneath burlap bands on trees. Low counts were obtained. Larval counts in future years may help determine when the next population increase will occur.

Maple Leaf Cutter, Paraclemensia acerifoliella, remains widespread at light population levels with no defoliation visible from the air. No sugarbushes required aerial spraying for this insect in 1985.

Forest Tent Caterpillar, Malacosoma disstria, caused no visible defoliation this year although occasional larvae were observed throughout most of the region. Tree mortality, mostly of sugar maple, following the 1978-1982 outbreak was less noticeable this year (13,200 of the 22,342 acres detected in 1984 were mapped again this year) but an additional 3,192 acres of dieback and mortality associated with defoliation was detected for the first time (Table 1, Map 5).

Table 1. Acres of mortality associated with Forest Tent Caterpillar Defoliation, detected for the first time in 1985.

County	Acres of Mortality*			
	Light	Moderate	Heavy	Total
Franklin	1909	0	0	1909
Lamoille	0	1083	0	1083
Orleans	200	0	0	200
TOTAL	2109	1083	0	3192

*Light mortality = 1-10 percent, scattered or patchy
Moderate mortality = 11-25 percent, scattered
Heavy mortality = over 25 percent

This brings the total area of dieback and mortality associated with this insect to 25,534 acres for the region and approximately 33,500 acres for the state. Another 5,259 acres of hardwood decline (including sugar maple) not associated with insect defoliation was also detected and will be discussed under Diebacks and Declines. A ground impact survey of over 80 defoliated sites was completed this summer and the results should be available in early 1986.

Sugar maples in plots established in Camels Hump State Forest to compare tree condition between an area that received a shelterwood cut following two years of heavy defoliation with an adjacent uncut area continue to show improvement in the cut area but remain fairly stable in the uncut area (Table 2).

Table 2. Average percent crown dieback on sugar maple, cut vs. uncut areas on Camels Hump State Forest.

N.	Area	Average Percent Dieback			
		1982	1983	1984	1985
31	Shelterwood (BA=51)	25	23	20	18
36	Uncut (BA=113)	22	22	23	22

The only individual trees in either area that worsened in crown condition in 1985 were those with complicating stress problems such as stem rot or severe logging wounds.

Forest Tent Caterpillar pheromone traps were tried for the first time this year to see if they would be useful for predicting population increases in advance of noticeable defoliation. Clusters of five

traps were placed in a sugar maple stand in each of the following towns: Roxbury, Bethel, Waterbury and Fairfield. Each cluster caught an average of 0.6 moths per trap, regardless of location. This unusual consistency may indicate that when the insect is at very low levels, populations tend to be uniform throughout its host range. Future trapping should determine whether this uniformity remains consistent as well as predict when populations are increasing.

HARDWOOD DEFOLIATORS

N.O.= not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Birch Leaf Miner *Fenusa pusilla*	white birch gray birch	widespread	L - M
Birch Leaf Folder *Ancylis discigerana*	yellow birch	Lamoille County	V. light & scattered
Birch Skeletonizer *Bucculatrix canadensisella*			N.O.
Bruce Spanworm *Operophtera bruceata*	sugar maple	Orleans County Washington County	light defoliation only
Eastern Tent Caterpillar *Malacosoma americanum*	cherry apple	widespread	very light
Elm Leaf Beatle *Pyrrhalta luteola*	American Elm	Addison Chittenden Lamoille Orange Counties	Heavy on some trees, esp. in Addison Co.
Fall Cankerworm *Alsophila pometaria*			N.O.

HARDWOOD DEFOLIATORS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Fall Webworm *Hyphantrea cunea*	Chokecherry	widespread	few webs observed
Forest Tent Caterpillar *Malacosoma disstria*	See Narrative		
Green Striped Mapleworm *Anisota rubicunda*	sugar maple	Franklin Chittenden Counties	occasional larvae observed
Gypsy Moth *Lymantria dispar*	See Narrative		
Half Winged Geometer *Phigalia titea*			N.O.
Large Aspen Tortrix *Choristoneura conflictana*			N.O.

HARDWOOD DEFOLIATORS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Linden Looper *Erranis tiliaria*			N.O.
Locust Leaf Miner *Odontata dorsalis*	black locust	all counties excpt Orleans, Essex & Caledonia	occasionally heavy defoliation in locust stands
Maple Leaf Cutter *Paraclemensia acerifoliella*	See Narrative		
Maple Trumpet Skeletonizer *Epinotia aceriella*	sugar maple	widespread	very light occasional damage
Maple Webworm *Tetralopha asperatella*	sugar maple	Essex Junction	a few colonies at the nursery
Mountain Ash Sawfly *Pristophora genicultata*	mountain ash	widespread	common on ornamental mountain ash

HARDWOOD DEFOLIATORS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Pin Oak Sawfly *Caliroa sp.*			N.O.
Saddled Prominent *Heterocampa guttivata*	sugar maple beech	Franklin, Chittenden & Addison Counties	an occasional caterpillar seen
Satin Moth *Leucoma salicis*	poplar	Milton Essex	heavy on a few individual ornamentals
Solitary Leaf Roller *Sparganothis pettitana*	Sugar Maple	Essex Junction	light population at nursery
Spring Cankerworm *Paleacrita vernata*			N.O.
Uglynest Caterpillar *Archips cerasivoranus*	cherry	widely scattered	light

HARDWOOD DEFOLIATORS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Orange-humped Mapleworm *Symmerista leucitys*	sugar maple	Fletcher Duxbury	occasional colony noticed
Japanese Beetle *Popillia japonica*	yellow birch	Essex Junction St. Johnsbury	found defoliating containerized nursery stock and ornamentals
Pearslug *Caliroa cerasi*	cherry	Stowe	heavy on ornamental shrubs
Spiny Oak Sawfly *Perclista* sp.	red oak	Milton	light defoliation in an oak stand
Lilac Leaf Miner *Gracillaria syringella*	lilac	Chittenden Lamoille Counties	widespread light to moderate damage
American Dagger Moth *Acronicta americana*	sugar maple red maple	widespread	very light defoliation; larvae common in late summer
Rose Chafer *Macrodactylus subspinosus*	ornamentals	Caledonia County	light

Softwood Defoliators

Spruce Budworm, Choristoneura fumiferana, populations continued to be very low in 1985 with no defoliation visible by aerial survey for the second consecutive year. Numbers of large larvae remained at very low levels equal to those found in 1984.

Pheromone traps were deployed in 15 stands, including five that were formerly heavily infested. Moth catch was less than expected but since trap methodology is still in the experimental stage, it is not known whether this is a true indication of a further population decline. In plots containing the same trap and lure combination, as used in 1984, moth catch was down 94 percent. Unitraps with PVC lures and Vapona strips as a killing agent were the most effective at catching spruce budworm male moths, while Multi-pher traps (Figure) with the same lure and flea collars as killing agents were the least effective. Moth counts in formerly heavily infested stands were not much greater than in the traditionally lightly infested stands. This was unexpected and could indicate an area-wide population drop if trap results are reliable. The results of our current survey for numbers of overwintering larvae should determine whether this is the case.

Spruce-fir mortality detected during the annual aerial survey dropped from 46,417 acres in 1984 to 11,750 acres this year (Table 3, Map 1).

Table 3. Acres of mortality in 1985 due to Spruce Budworm

	Acres of Mortality*			
County	Light	Moderate	Heavy	Total
Caledonia	1260	820	274	2354
Essex	181	1059	4736	5976
Lamoille	0	0	595	595
Orleans	520	613	1692	2825
TOTAL	1961	2492	7297	11750

*Light mortality = 1-10 percent, scattered or patchy
Moderate mortality = 11-25 percent, scattered
Heavy mortality = over 25 percent

The majority of areas that were formerly mapped as having less than heavy mortality went undetected this year because there are now fewer standing dead trees and many trees whose crowns have recovered.

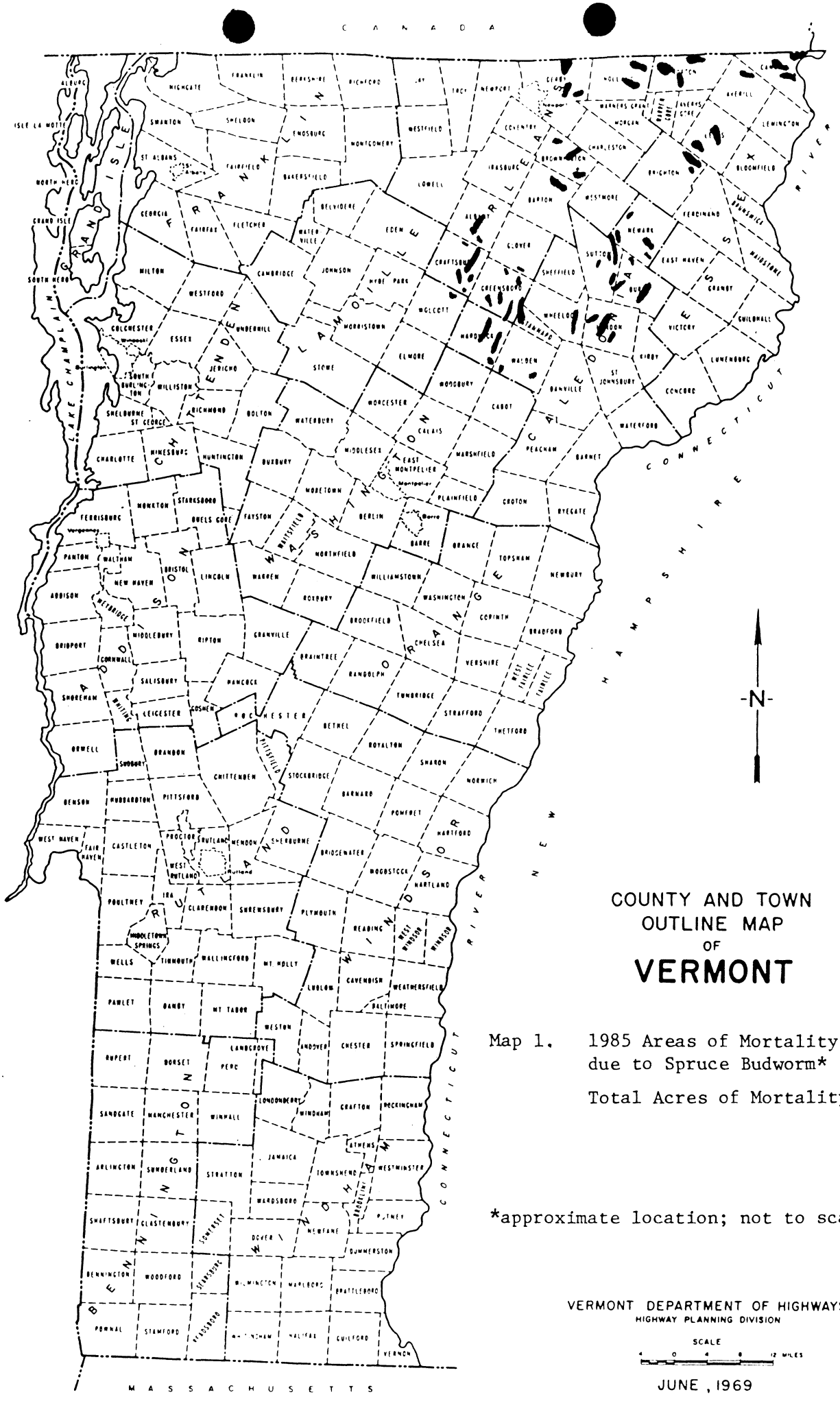
Budworm-caused mortality of fir and spruce that occurred during the past year was estimated from a survey of 12 plots in areas that contain light, moderate and heavy mortality, four plots per category. Mortality rates (percent of original number of trees over 4.5 inches, dbh) for 1985 were 2.5, 2.5, and 6.5 percent, respectively for lightly, moderately

and heavily damaged stands compared to 3.5, 5.6 and 16.3 percent for 1984. These percentages were applied to average per acre volume and density data from the 1980 Orleans County Spruce Budworm Mortality Survey and acres of mortality from Table 3 to produce the loss estimates in Table 4.

Table 4. Estimated tree mortality in 1985 due to Spruce Budworm

County	Number of Trees Dead	Total Volume Lost (cords)
Caledonia	16,100	1,720
Essex	78,200	8,350
Lamoille	8,900	950
Orleans	31,900	3,410
TOTAL	135,100	14,430

The reduction in mortality rates as well as acres of mortality detected this year is reflected in a total volume loss for 1985 of 14,430 cords compared to 94,150 cords in 1984. Timber value of 1985 losses based on an average stumpage price of $8 per cord is 115,440 dollars.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 1. 1985 Areas of Mortality due to Spruce Budworm*

Total Acres of Mortality=11,750

*approximate location; not to scale

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE

JUNE, 1969

SOFTWOOD DEFOLIATORS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	northern white cedar	widespread	very light
Introduced Pine Sawfly *Diprion similis*	white pine	Montpelier	a single larva found
Larch Casebearer *Coleophora laricella*	eastern larch	Chittenden, Orange & Washington Counties	moderate to heavy defoliation in a few stands; populations probably increasing
Larch Sawfly *Pristophora erichosonii*			N.O.
Red Headed Pine Sawfly *Neodiprion lecontei*	red pine	Franklin County	light defoliation of a few trees
Spruce Budworm *Choristoneura fumiferana*	See Narrative		

SOFTWOOD DEFOLIATORS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Bud Moth *Zeiraphera canadensis*	white spruce	Orleans Caledonia Essex Lamoille Counties	scattered light defoliation
White Pine Sawfly *Neodiprion pinetum*	white pine	Brookfield	a few caterpillars observed
Yellow-headed Spruce Sawfly *Pikonema alaskensis*	blue spruce	Johnson Swanton	moderate defoliation of ornamentals
Pine Tip Moth Species undetermined	mugo pine	Chittenden County	light damage

Sapsucking Insects, Midges and Mites

Balsam Gall Midge, Paradiplosis tumifex, populations collapsed in most balsam fir Christmas tree plantations. Most plantations that experienced heavy damage in the past two to three years had extremely light damage this year. This was expected due to the control influence of the non-gall-making midge that was reported to be abundant in 1985. A few plantations where populations peaked later than in most still suffered moderate to heavy damage this year but this should decline in 1986.

Dursban, an insecticide not yet registered for balsam gall midge control, was compared to diazinon at two rates and two different shoot lengths (35mm and 50mm) in a heavily infested plantation in Hyde Park. This was a cooperative experiment with the University of Vermont Entomology Laboratory. Diazinon at the recommended shoot length (35mm) still gave the best results but Dursban 50W provided acceptable control and was equally effective at the 50mm (two inch) shoot length. The later (50mm) treatments with either material resulted in fewer developed galls than the early (35mm) treatments but left more needles with undeveloped galls. These needles do not drop from the branches but do cause some disfigurement of the foliage. We expect that Dursban (chlorpyrifos) will become registered for gall midge based on this data, providing growers with an alternative to diazinon.

Balsam Twig Aphid, Mindarus abietinus, populations increased, causing light to heavy damage to balsam fir Christmas trees. During the annual Scleroderris survey of Christmas trees, twig aphid was reported present on 230 acres, causing moderate to heavy damage to 116 of these acres. This compares to only 17 acres of light damage detected in the same locations in 1984. Populations are expected to peak in 1986.

Pear Thrips, Taeniothrips inconsequens, was responsible for widespread damage to sugar maple foliage early in the season. This is the first time that this damage has been identified in Vermont but it has been a problem in Pennsylvania during the past six years. The tiny sucking insect feeds within developing buds and on young foliage, causing yellow and green mottling between the veins and small brown wounds along the veins on the undersides of the leaves, and sometimes in the petioles. Heavy damage results in dwarfed, cutleafed, and distorted leaves with irregular margins. Tattered leaves superficially resemble frost damage.

Light damage was present throughout the region, with heavy damage restricted to Orange County, Addison County and the southern portions of Washington and Chittenden Counties. Sugarbushes and stands with a high percentage of sugar maple, particularly those at upper elevations, were the most affected. In some cases, leaf fall and early refoliation occurred, particularly in the tops of the crowns. But in most cases, leaves remained on the tree in a stunted, distorted condition. In some stands, this was equivalent to a moderate defoliation for the duration of the growing season. Root starch sampling in one heavily damaged sugarbush revealed mostly medium starch levels in roots of trees with heavy thrips damage compared to high levels in undamaged trees. These damaged trees can be considered moderately vigorous.

Spider mites, identified as Oligonychus aceris, and aphids, identified as Periphyllus americanus, were common on thrips damaged leaves during mid to late summer, causing a further deterioration in foliage quality.

SAPSUCKING INSECTS, MIDGES & MITES

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Gall Midge *Paradiplosis tumifex*	See Narrative		
Balsam Twig Aphid *Mindarus abietinus*	See Narrative		
Balsam Woolly Aphid *Adelges piceae*	balsam fir	Lamoille County	scattered light populations
Cooley Spruce Gall Aphid *Adelges cooleyi*	blue spruce Douglas fir	Franklin, Chittenden Addison, Orleans Washington & Orange Counties	ornamentals & Christmas trees; heavy damage to ornamentals in Calais
Eastern Spruce Gall Aphid *Adelges abietis*	red, white & Norway spruce	widespread	light and scattered
Oystershell Scale *Lepidosaphes ulmi*	American Beech flowering crab	Addison Chittenden Franklin & Lamoille Counties	moderate to heavy on beech understory; also on ornamental crab in Stowe

SAPSUCKING INSECTS, MIDGES & MITES

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Pine Bark Aphid *Pineus strobi*	white pine	widespread	occasionally heavy, damaging Christmas tree seedlings in Orange County
Pine Needle Midge *Contarinea baeri*	Scots pine	Bakersfield	heavy scattered damage to Christmas trees
Pine Spittlebug *Aphrophora parallela*	white pine	Addison Chittenden Franklin Caledonia Washington & Lamoille Counties	widespread, light populations
Root Aphid *Prociphilus americanus*	balsam fir	Lamoille County	continues to infest Christmas tree seedlings in a few plantations
Spruce Spider Mite *Oligonychus ununguis*	white spruce N. white cedar balsam fir	Chittenden Caledonia Lamoille & Washington Counties	light to moderate on ornamental spruces and cedar; scattered light damage to fir Christmas trees; populations up
Maple Gall Mites *Eriophyidae*	sugar maple red maple	widespread	light

N.O. = not observed

SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Gall Midge *Mayetiola piceae*	norway spruce ornamental	Barre	heavy damage first report of this pest in Vermont
Pine Needle Scale *Phenacaspis pinifoliae*	mugo pine white pine	Chittenden County	scattered, light damage

BUD, SHOOT & STEM INSECTS

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Shootboring Sawfly *Pleroneura bruneicornis*	balsam fir	scattered	very light damage to Christmas trees; populations down from 1984
Northern Pine Weevil *Pissodes approximatus*			N.O.
Pales Weevil *Hylobius pales*	Scots pine balsam fir	widespread	light to moderate damage to Christmas trees and some ornamentals. Populations up from 1984
White Pine Weevil *Pissodes strobi*	white pine white, norway & blue spruce	widespread	heavier than usual in some locations
Pine Gall Weevil *Podapion gallicola*	red pine	Quechee	moderate damage to a plantation
Pitted Ambrosia Beetle *Corthylus punctatissimus*	sugar maple seedlings	Addison Franklin Chittenden Counties	common in sugarbushes
Maple Seed Caterpillar *Proteoteras aesculana*	sugar maple	Addison Chittenden Franklin Counties	light damage to understory maples
A pine shoot mite *Trisetacus alborum*	white pine	Middlesex	light shoot damage in a plantation

BARK BEETLES

N.O. = not observed

INSECT	HOST(S)	LOCALITY	REMARKS
List any that were associated with or thought to be the cause of tree mortality			
Pine Engraver *Ips pini*	red pine	Westmore Leicester	causing scattered mortality of pole-size plantation trees

FOREST DISEASES

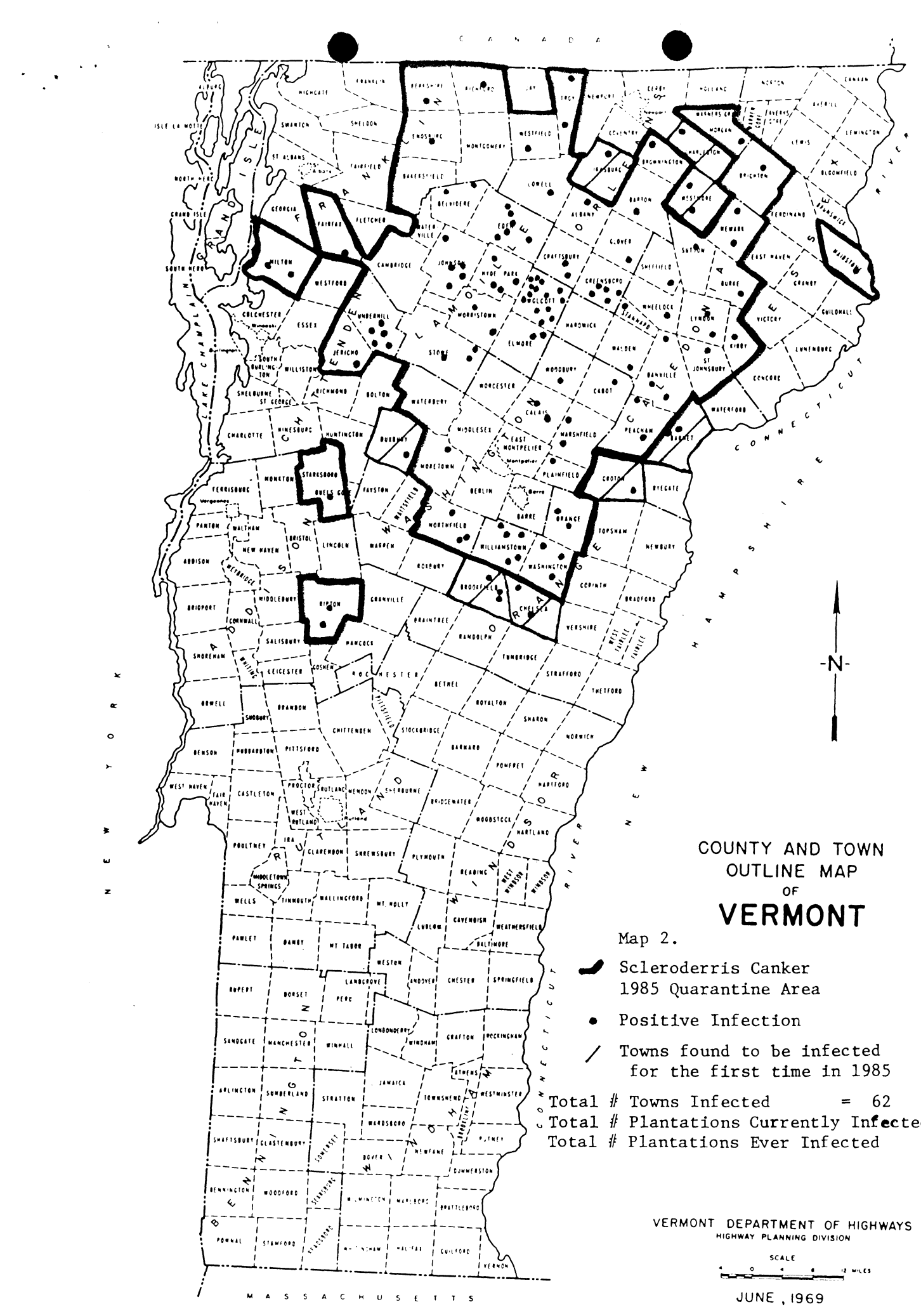
Stem Diseases

Scleroderris Canker, caused by Gremmeniella abietina, was found in eight previously negative towns again this year (Map 2), during a survey of 130 plantations in 19 towns bordering the quarantine zone. This means that 16 new towns have been found to contain infected trees during the past two years. Infection rates have increased during this period, probably due to wet spring weather in 1983 and 84. Seventeen pine plantations (three within the quarantine zone), comprising 69 acres, were found to be infected for the first time this year. Another 90 plantations (317 acres) in the southern four counties were surveyed but no Scleroderris was found.

Forty-three pine Christmas tree plantations within 22 towns inside the quarantine area were inspected this year. One of these, a plantation in Wolcott containing Scots pines that are now too large to be marketable, was found to be infected for the first time. Scots pines from many older plantations are being cut and replaced with non-susceptible species while some Scots and white pine seedlings are being planted in other locations.

A survey of Lyndon State Forest that was reported infected in 1984 revealed that 75 percent of the Scots pine regeneration is infected and another 18 percent dead, while 91 percent of the white pine is infected and six percent is dead. A survey of the white pine seedlings that were planted in 1984 revealed that 26 percent were infected in early June 1985, increasing to 29 percent in October. Since seedlings closest to infected Scots pine regeneration had the most infection, this regeneration was cut during the summer in the hope that it will reduce future seedling infection.

The total number of plantations in the state known to be infected is now 122, consisting of 104 red pine and 18 Scots pine plantations. This represents 820 and 150 acres, respectively, for a total of 970 acres infected. Another six plantations were infected at one time but have since had the disease eradicated or the trees cut.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 2.

Scleroderris Canker 1985 Quarantine Area

Positive Infection

Towns found to be infected for the first time in 1985

Total # Towns Infected = 62
Total # Plantations Currently Infected = 122
Total # Plantations Ever Infected = 128

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE 0 4 8 12 MILES

JUNE, 1969

STEM DISEASES

N.O. = not observed

DISEASE	HOST(S)	LOCALITY	REMARKS
Verticillium Wilt *Verticillium albo-atrum*	sugar maple	Milton	light damage
White Pine Blister Rust *Cronartium ribicola*	white pine	widespread	continued heavy damage as in 1984 causing some losses in young Christmas tree plantations
Woodgate Gall Rust *Endocronartium harknessii*	Scots pine	scattered	some moderate to heavy damage to Christmas trees
Sapstreak Disease *Ceratocystis coerulescens*	sugar maple	Chelsea	one wounded sugarbush tree affected (Figures 4 & 5). I.D. confirmed by Dr. Bergdahl, UVM

Foliage Diseases

Fir-fern rust of balsam fir, caused principally by Uredinopsis mirabilis, caused widespread light to moderate defoliation of balsam fir Christmas trees but there was not the heavy damage reported in some plantations in 1983 and 84. Long term control is best obtained by eliminating sensitive fern, which serves as the alternate host for the fungus. But thanks to experimental fungicide tests conducted by Dr. Dale Bergdahl at the University of Vermont, Bayleton 25 is now registered for spraying on fir foliage to prevent infection. Eight ounces of Bayleton 25 per 50 gallons of water, plus a spreader-sticker, can give adequate control if applied when new shoots average two to three inches in length. A one page handout on control of this disease is available from our department.

FOLIAGE DISEASES

N.O. = not observed

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose *Gloeosporium* spp.	sugar maple	Addison Caledonia Orleans Counties	scattered light damage, especially on well-drained or shallow soils
Lophodermium Needlecast *Lophodermium pinastri*	Scots pine	widespread	mostly light damage to Christmas trees
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas fir	Essex Wolcott	light-moderate damage
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*			N.O.
Swiss Needlecast *Phaeocryptopus gaumani*	Douglas fir	Essex	light damage
Cedar-Apple Rust *Gymnosporangium juniperi-virginianae*	E. red cedar apple	Franklin Chittenden & Addison Counties	scattered, light damage
Naemacyclus Needlecast *Naemacyclus nireus*	Scots pine	Barre	light on Christmas trees

N.O. = not observed

ROOT ROTS

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*	red pine	Chelsea	new infection center
Shoestring Root Rot *Armillaria mellea*	many	widespread	continues to be associated with tree decline

Diebacks, Declines and Environmental Diseases

Ash Dieback continues to be observed and appears to be increasing in some locations, especially at upper elevations.

Birch Decline was more noticeable than usual in some locations, especially in the Camel's Hump area.

Larch Decline continues to some extent, especially in areas of previously heavy mortality. Five hundred and forty-four acres of mostly light mortality was mapped in the Northeast Kingdom during the annual aerial survey.

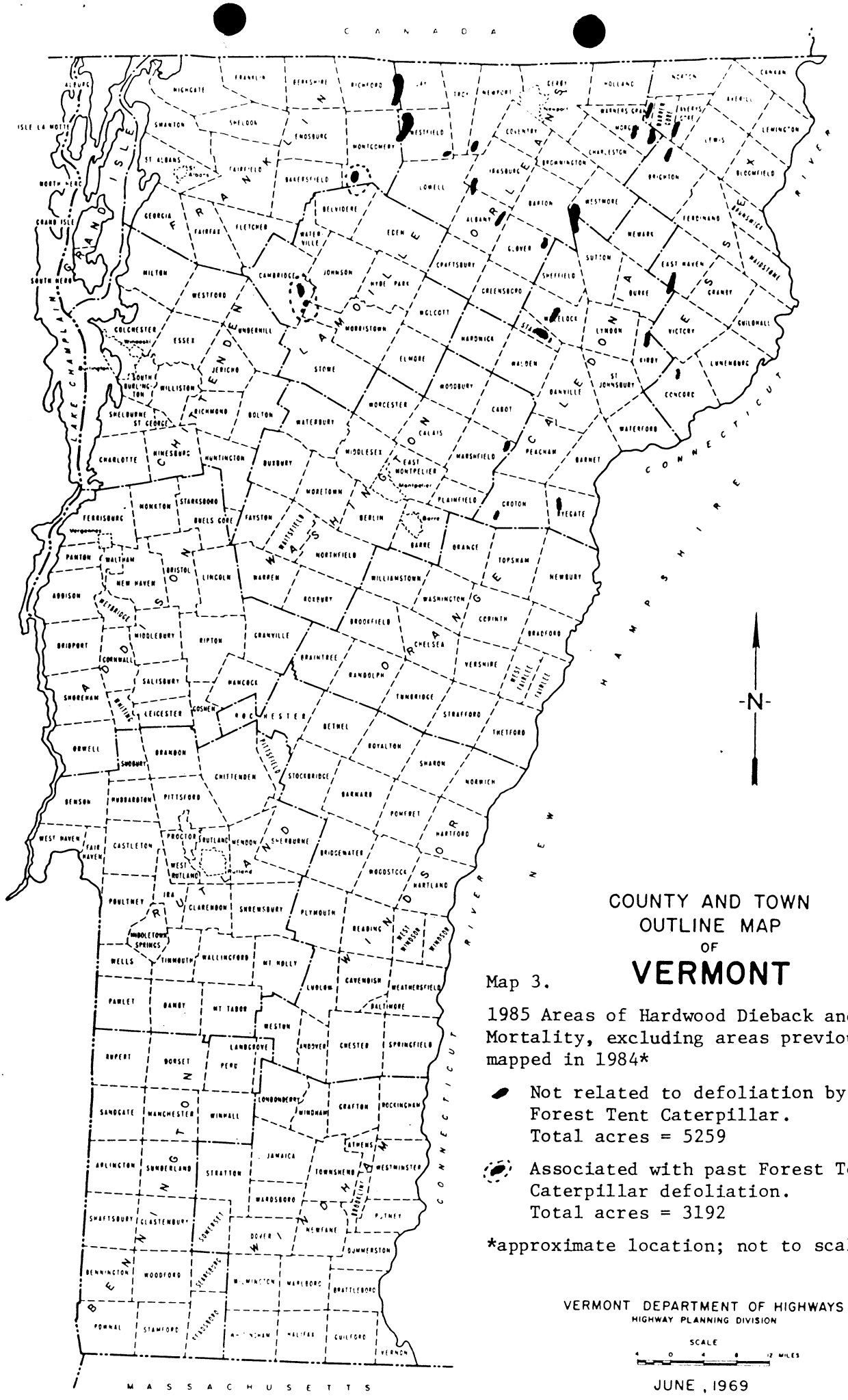
Maple Decline increased this year, especially in the northern counties. Aerial surveys revealed 5,259 acres of hardwood decline, much of this maple, which is unrelated to forest tent caterpillar defoliation (Table 5, Map 3). An additional 3,192 acres of decline in areas previously defoliated was detected for the first time this year. Cause of the increased dieback and mortality is largely unknown but recent research by Bob Gregory at the Aiken Forest Service Laboratory in Burlington indicates that trees utilize a lot more food reserves in response to abnormally cold winters than before realized. Since the most decline is in areas with the coldest winter temperatures, it may be related to the abnormally cold open-winter of 1980-81. A statewide decline survey of 54 sugarbushes that had been surveyed in 1977 was conducted this summer to determine any changes in sugar maple condition since then. Also, statewide aerial photography of about 170 points was obtained this summer to determine the overall extent of hardwood decline, with photointerpretation scheduled for this winter and ground surveys in 1985.

Table 5. 1985 Hardwood Decline not related to Forest Tent Caterpillar defoliation

	Acres of Dieback and Mortality*			
County	Light	Moderate	Heavy	Total
Caledonia	554	0	0	554
Essex	225	1014	0	1239
Franklin	1466	0	0	1466
Orleans	2000	0	0	2000
TOTAL	4245	1014	0	5259

*Light mortality = 1-10 percent, scattered or patchy
Moderate mortality = 11-25 percent, scattered
Heavy mortality = over 25 percent

Red Spruce Decline remains common in high elevation sites as well as in certain well-drained lower elevation stands. Aerial survey revealed 1453 acres of upper elevation spruce decline this year (Table 6, Map 4).



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 3.

1985 Areas of Hardwood Dieback and Mortality, excluding areas previously mapped in 1984*

- Not related to defoliation by Forest Tent Caterpillar. Total acres = 5259
- Associated with past Forest Tent Caterpillar defoliation. Total acres = 3192

*approximate location; not to scale

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE

JUNE, 1969

Permanent spruce decline monitoring plots were established throughout the state by the U.S. Forest Service this year to follow tree condition over time.

Table 6. 1985 Red Spruce mortality

	Acres of Mortality*			
County	Light	Moderate	Heavy	Total
Caledonia	25	0	0	25
Essex	50	212	0	262
Franklin	0	548	0	548
Lamoille	0	175	0	175
Orleans	1	442	0	443
TOTAL	76	1377	0	1453

*Light mortality = 1-10 percent, scattered or patchy
Moderate mortality = 11-25 percent, scattered
Heavy mortality = over 25 percent

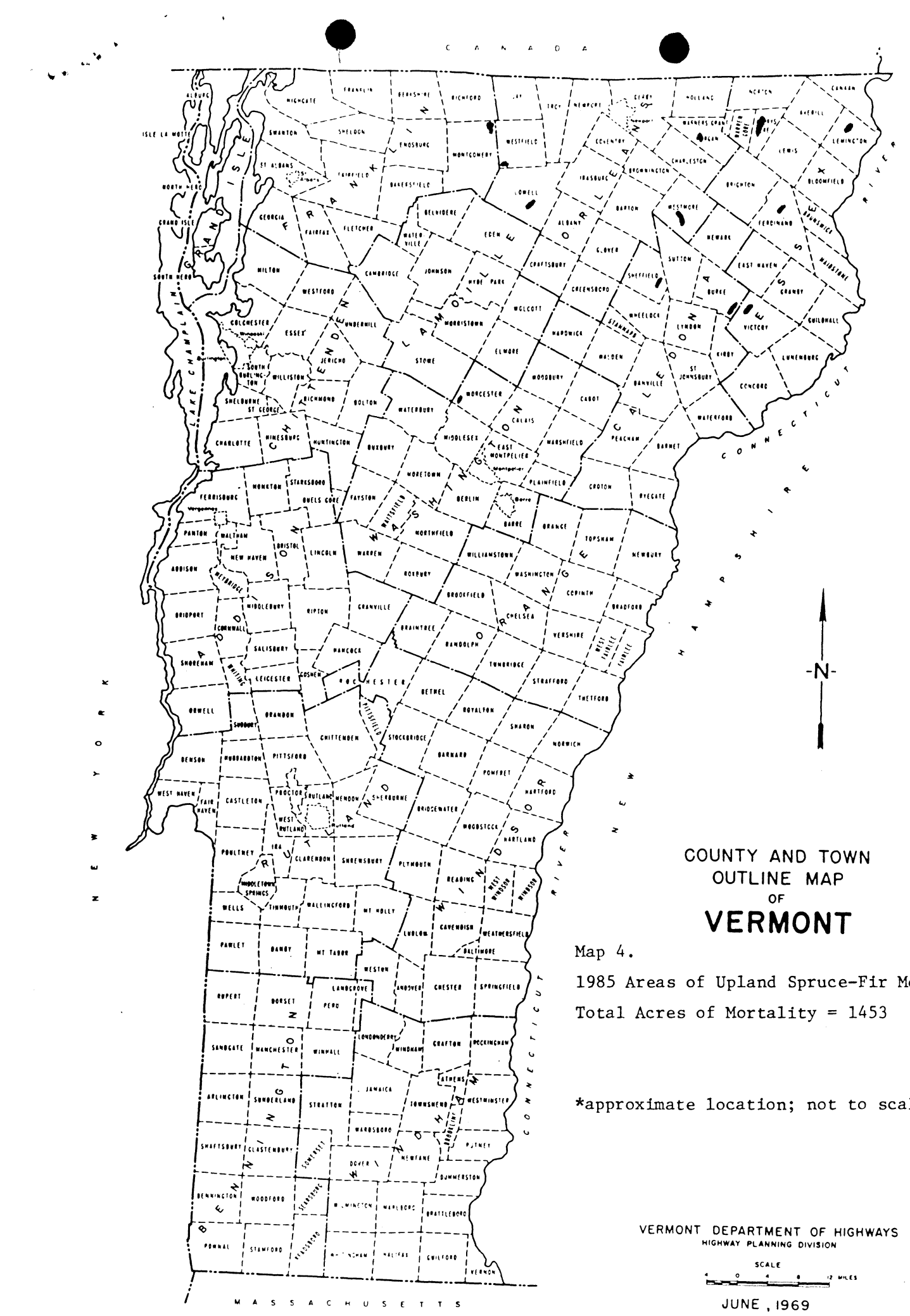
Wet Feet - areas prone to flooding exhibited noticeable tree decline this year. Some fir mortality was found to be located in such areas and is probably related to the flood of June 1984. Most species affected, however, are non-commercial.

White Pine Needle Blight caused widespread, scattered heavy browning of current needles on individual susceptible white pines this year for the third year in a row. Damage was heavier than in 1984 in most areas, especially in the northern-most counties. The blight is thought to be initiated by ozone pollution combined with certain weather conditions during needle elongation.

ANIMAL DAMAGE

N.O. = not observed

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Deer	Christmas trees	scattered	some moderate to heavy browse damage
Mouse	Christmas trees	scattered	light damage
Porcupine	Many	scattered	damage increasing in NE Kingdom
Squirrel	maple tubing Norway spruce	widespread Washington Cty.	moderate to heavy damage to tubing in sugarbushes where softwoods are present. Feeding damage to 50% of spruces in Jones State Forest
Rabbit	Scots pine	North Hero	80% loss of a plantation
Beaver	all	Franklin Chittenden Addison Counties	population increase due to low pelt prices has led to an increase in damage



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 4.

1985 Areas of Upland Spruce-Fir Mortality*

Total Acres of Mortality = 1453

*approximate location; not to scale

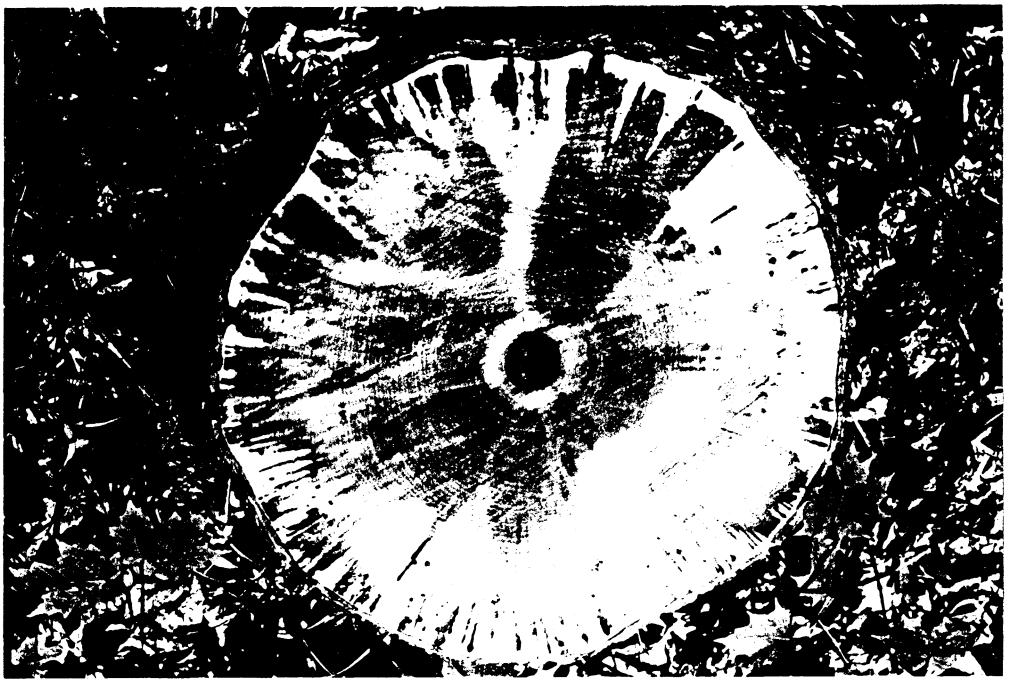
VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

JUNE, 1969

Figure 1. Multi-pher pheromone trap used in 1985 to monitor light spruce budworm populations by capturing male moths.

Figures 2 and 3. Heavy pear thrips damage to sugar maple foliage. Note the tattered, crinkled, mottled, and stunted appearance of the upper leaves (left) and individual leaves (below).



Figures 4 and 5. Sapstreak Disease of sugar maple. This disease enters through wounds and can kill trees rather quickly. Major symptoms are brown streaking with green-margined fingers (above) and leaves half of normal size (below).

Leaves from sapstreak infected tree (left) compared to normal leaves (right).